TESTING THE VALIDITY OF THE COMPENSATION HYPOTHESIS BY USING PANEL DATA ANALYSIS

PANEL VERİ ANALİZİ İLE TELAFİ HİPOTEZİNİN GEÇERLİLİĞİNİN SINANMASI

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ABSTRACT

The compensation hypothesis has been examined throughout the literature, but there is limited research testing whether the validity of this hypothesis varies between low- and high-classification countries. Thus, the present paper extends the analysis to examine whether or not the relationship between openness and government size fluctuates across low- and high-classification countries. The classifications are based on foreign direct investment, current account, portfolio investment and income. By using a panel of 145 countries over the period 1970-2017, this paper provides robust empirical evidence about the validity of the compensation hypothesis. Regardless of the countries' classifications, the empirical results do not differ and they confirm the compensation hypothesis proposed by Rodrik (1998).

Keywords: Trade openness, government size, the compensation hypothesis.

ÖZ

Telafi hipotezi (compensation hypothesis) literatürde birçok çalışmada incelenmiştir, ancak bu hipotezin geçerliliğinin farklı ülke özelliklerine göre değişip değişmediğine dair sınırlı sayıda çalışma bulunmaktadır. Dolayısıyla, bu çalışmada dışa açıklık ve kamu harcamalarının büyüklüğü arasındaki ilişkinin nasıl farklılık gösterdiği analiz edilmiştir. Farklı ülke özellikleri için doğrudan yabancı sermaye yatırımları, cari açık, portföy yatırımları, kişi başı milli gelir temel alınmıştır. Çalışma 1970-2017 dönemine ait 145 ülkeden oluşan panel veri seti kullanarak telafi hipotezinin geçerliği hakkında güçlü ampirik kanıtlar sunmaktadır. Bulgular telafi hipotezinin geçerliğinin farklı ülke özelliklerine göre değişmediğini göstererek Rodrik (1998) tarafından geliştirilen telafi hipotezinin geçerliliğini doğrulamaktadır.

Anahtar Sözcükler: Dışa açıklık, kamu harcamaları, telafi hipotezi.

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1. Introduction

The increase in globalization led to the redefinition of the economic risk perception. The increase in globalization also brings about several pressures on governments to increase their government expenditure in order to compensate the potential risks that may arise. That policy has been a popular research topic. The first paper, by Cameron (1978), emphasizes a positive relationship between trade openness and the size of government for a sample of 18 OECD countries. The second paper, by Rodrik (1998), highlights that increasing trade openness may cause increased demand for government expenditure to compensate for growing external risk, which is commonly known as *the compensation hypothesis*. Rodrik (1998) validates Cameron's findings, but government size is consumption instead of government revenues in Rodrik's findings, and Rodrik (1998) also emphasizes a causal relation instead of a correlation. Furthermore, Rodrik (1998) expands the sample of 18 OECD countries used by Cameron (1978) to a sample of more than 100 countries.

According to *the compensation hypothesis*, when a country integrates further into the world economy, the country is challenged by increased inequality and exposed to more external risks. This situation brings about growing demands for compensation mechanisms, which then leads to an increase in government expenditure (Rodrik, 1998; Liberati, 2007; de Jong, 2017). We could therefore suggest that openness is an important determinant to explain increasing government consumption. The validity of the compensation hypothesis has been tested by many papers. Both similar results and opposite results have also been found (Liberati, 2007; Ram, 2009; de Jong, 2017). There have been various criticisms to Rodrik's (1998) findings such as Rodrik's use of cross-country data instead of time-series (Green, 2003). This is a disputable issue while the growth of size is a dynamic process (de Jong, 2017). Alesina and Wacziarg (1998) criticize Rodrik's hypothesis that country size could mediate a positive correlation between trade openness and government expenditure. On the other hand, Ram (2009) argues that the results of Alesina and Wacziarg (1998) are mainly from a methodological perception and they put some evidence of a direct positive relationship between openness and government size.

More importantly, Liberati (2007) criticizes the compensation hypothesis. According to Liberati (2007), capital flows increase during the 80s, but they are not taken into account by either Rodrik or Cameron. Therefore, the relationship between economic openness and size of government may be better explained by *the efficiency hypothesis*, which highlights that national governments will supply smaller public sectors when amplified flexibility of production factors is required due to economic openness. In this sense, the efficiency hypothesis anticipates a negative correlation between capital flows and government size, and it claims that governments lose their taxation abilities or are unable to have huge budgetary deficits because of the growing significance of FDIs (de Jong, 2017). There is some empirical evidence in line with the efficiency hypothesis (Liberati, 2007; Bullmann, 2008).

The opposing dynamics of *the compensation hypothesis* and *the efficiency hypothesis* are a matter of empirical investigation rather than a theoretical point of view (Liberati, 2007). Governments have a tendency to protect their citizens from external risks due to trade openness. In this sense, the question arises whether or not the increase in government expenditure is the result of the compensation hypothesis and the validity of this hypothesis differs based on different categories of country structure.

The compensation hypothesis has been studied throughout the literature, but there are few studies that test whether the validity of this hypothesis differs between low- and high-classification countries. Liberati (2007) emphasizes that foreign direct investment and portfolio investment can both affect the formation of government size and the validity of the compensation hypothesis. Benarroch and Pandey (2012) suggest that, considering its role in both enhancing social welfare and sharing the world resources, income levels of countries significantly modify the validity of compensation hypothesis. Also, Liberati (2007) argues that current account balance creates a pressure on the level of public expenditures that may play an important role on the validity of the compensation hypothesis. We could suggest that it is important to take into account the effect of foreign direct investment, current account, portfolio investment and income on the relationship between trade openness and government size. Thus, the present paper extends the analysis so as to consider whether the relationship between openness and government size differs across low foreign direct investment versus high foreign direct investment countries, low current account versus high current account countries, low portfolio investment versus high portfolio investment countries, and low-income versus high-income countries. Furthermore, this paper additionally extends the analysis to consider 12 different panels constructed based on population, trade openness, GDP, urban population, and age dependency ratio so that the robustness of empirical findings could be tested. The empirical results provide robust empirical evidence of the validity of the compensation hypothesis proposed by Rodrik (1998), no matter what classification the countries are in.

The following section includes a literature review. Next, Part 3 shows empirical results as description of data, the model specification and robustness check of empirical findings. Finally, Part 4 concludes.

2. Literature Review

The effects of trade openness on government size may be summarized by two core hypotheses. The first hypotheses is the compensation hypothesis of Rodrik (1998), which has recently gained much interest. The compensation hypothesis holds that trade openness makes an economy more vulnerable to external shocks. Governments increase share in the economy so that external risks can be counterbalanced. Many other papers support the compensation hypothesis. For example, Jeanneney and Hua (2004) use the same variables as Rodrik, they investigate the relationship between trade openness and government size, and they show positive and significant results confirming the compensation hypothesis. Alesina and Wacziarg (1998) put some empirical evidence in accordance with the compensation hypothesis.

Garen and Task (2005) support the compensation hypothesis by examining the relationship between government expenditure and trade openness. Aytac (2014) supports the validity of compensation hypothesis by investigating the relationship between trade openness and government size between 2006 and 2012 in the case of Turkey. Also, Bretschger and Hettich (2002) focus on the globalization, tax competition and social expenditures in OECD countries. Their findings show that compensation hypothesis is valid in social expenditures. Epifani and Gancia (2009) investigate the relationship between openness and government size. They develop and test a model using cross-section data of 143 countries. Their results suggest a positive relationship. Shelton (2007) investigates the determinants of government expenditures and shows a positive relationship between openness and government size for industrialized and less-developed countries. Kimakova (2009) investigates the link between financial openness

and government size in 87 countries for the period from 1976 to 2003. The results indicate a significant and robust positive relationship between government size and financial openness, which is consistent with the compensation hypothesis of Rodrik (1998). Zakaria and Shakoor (2011) use the data over the years 1947-2009 and test the relationship between openness and government size in Pakistan. They find a positive and robust relationship between openness and government size. Amin and Murshed (2016) test the causal relationship between openness and government size in Bangladesh and their results confirm the compensation hypothesis. Balle and Vaidya (2002) analyze the Rodrik's hypothesis for the US and find a correlation between openness and government size. In addition, openness is positively correlated with public welfare and health spending.

On the other hand, there is also some empirical evidence against the compensation hypothesis. For example, Benarroch and Pandey (2008) utilize both aggregate and disaggregated government expenditure data to investigate the association between trade openness and government size. Their results suggest no positive relationship between government size and trade openness, and lower trade openness for larger government size. Benarroch and Pandey (2012) also suggest no positive causal correlation between openness and social security, and they find no evidence confirming the compensation hypothesis as proposed by Rodrik (1998). Kaufman and Segura-Ubiergo (2001) use a VECM model in 14 Latin American countries for 1973-1997 period to investigate the effects of globalization, democratization and partisanship on social expenditures. Their results suggest a negative effect of openness on aggregate social expenditure, which is not supported by the compensation hypothesis of Cameron (1978) and Rodrik (1998). Aydogus and Topcu (2013) investigate the link between trade openness and government size in Turkey for 1974-2011 period. They do not provide any evidence supporting the compensation hypothesis in Turkish economy. Furthermore, Abizadeh (2005) uses time-series data covering the years 1960-2000 for Canada, the United States, South Korea, Singapore, Egypt, and Uruguay to explore the relationship between government expenditures and trade. The findings show that government size decreases as the trade openness increases in small and traditionally open countries (e.g. Canada, Singapore and Uruguay).

The second hypothesis about the effects of trade openness on government size is the efficiency hypothesis. The efficiency hypothesis suggests that due to growing globalization, governments feel increased pressure to reduce their taxes so that mobile capital can be avoided. Policymakers are also advised to cut spending since international financial market integration also penalizes deficit spending (Liberati, 2007; Ruggie, 1982; Busemeyer, 2009). There are numerous papers in the literature that put some evidence supporting the efficiency hypothesis (Liberati, 2007; Garrett and Mitchell, 2001; Jahn, 2006). For example, Liberati (2007) offers empirical evidence of the association among trade openness, capital openness and government expenditures. The results show a negative relationship between government expenditures and capital mobility, which is in favor of the efficiency hypothesis. Garrett and Mitchell (2001) study the OECD countries to examine the effect of globalization on welfare state effort and analyze Welfare effort in terms both public spending and taxation. They conclude that trade openness and government size is negatively correlated, which supports the efficiency hypothesis.

The empirical studies show mixed results on testing the relationship between government size and openness. The reason for this situation could be the choice of data sample, time period of analysis, measures used to proxy both government size and trade openness, and the method

of estimation (Dixit, 2014). For example, Jetter and Parmeter (2015) replicate Ram's (2009) paper by using more recent datasets such as Penn World Table 6.1, 7.1 and 8.0. They take care in the choice of dataset because, when the PWT 6.1 is chosen, the relationship between trade openness and government size is strongly positive. However, when the PWT 7.1 is chosen, the positive relationship is weaker than the case for PWT 6.1. Also, there is no relationship when PWT 8.0 is used. Furthermore, Arawatari (2015) states that the capital-labor ratio can explain the controversial relationship between trade openness and government size. Islam (2004) examines the long-term relationship between government size and openness using time-series data from six countries including Australia, Canada, England, Norway, Sweden and the US. Islam (2004) performs a bounds test using Rodrik's model. The empirical findings of the bounds test show that there is a long-term relationship between openness and government size in Canada and the US, while there is no relationship in Australia, England, Norway and Sweden. Unlike the bounds test, the cointegration test shows that all the countries have a long-run relationship between openness and government size. In addition, there is a negative relationship between government size and openness in the US, contrary to the Rodrik's hypothesis. There is a positive relationship in Canada, England, and Norway. For Australia and Sweden, however, there is no relationship. Islam (2004) also shows that the relationship between trade government size and openness differs depending on the methods and countries selected. Similarly, Nwaka and Onifade (2015) and Olawole and Adebayo (2018) test the long-run relationship between openness and government size using bounds test and time series data. Nwaka and Onifade (2015) use dataset for the period 1965-2013 from Egypt, Ghana, Kenya, Nigeria and South Africa. Their findings show that there are controversial findings in Egypt and South Africa. A positive relationship between openness and government size is shown in Ghana and Nigeria, while a negative relationship is shown in Kenya. Olawole and Adebayo (2018) use dataset for the period 1986-2015 from Nigeria. They find a positive relationship between trade openness and government size. Ibrahim (2015) also focuses on African countries including South Africa, Nigeria, Algeria, Angola, and Egypt and utilizes time series data and ECM methodology from the period 1970-2010 to investigate the causal relationship between trade and government size by. The findings show that there is a positive causal relationship in Algeria and Nigeria, but there is a negative causality for South Africa. On the other hand, Angola and Egypt have no causal relationships.

Liberati (2013) provides contributions by comparing the papers of Alesina and Wacziarg (1998) and Ram (2009) using more recent panel data over the period 1962-2009. Despite supporting the compensation hypothesis and in contrast to what Alesina and Wacziarg (1998) suggest, Liberati's (2013) results do not show country size as a significant variable for testing the relationship between government size and openness. Liberati (2013) also discusses the cross-country heterogeneity proposed by Ram (2009), putting a special emphasis on African countries. When the African countries are included in the dataset, the compensation hypothesis is supported. Otherwise, when the African countries are excluded, the compensation hypothesis is not confirmed. Molana et al. (2011) emphasize the power of individual countries rather than panel data. They use time series data for 22 OECD countries over the period 1955–2003 to examine the presence of causality channels between government size and trade openness. They estimate their model for 22 individual countries rather than pooled panel data. Their results do not provide any evidence in favor of the compensation hypothesis since only five countries show evidence in favor of the hypothesis. They show how data plays a significant role for empirical findings.

In the light of these considerations, unlike the common literature, the present paper extends the analysis to consider whether or not the relationship between government size and openness fluctuates across low- and high-classification countries.

3. Empirical Results

3.1. Description of Data

The dataset derived from 145 world countries for the period 1960 to 2017 is shown in Table 2. This paper employs panel data that combines cross-section and time-series data to test for any endogenous interaction between general government expenditure (size) and total trade (openness). Table 1 shows some definitions in the data. All data is provided by the World Development Indicators (WDI).

Table 1. Data Definition

Variable Name	Short Definition
urban	Urban population
pop	Population, total
depend	Age dependency ratio (% of working-age population)
openness	Trade (% of GDP)
size	General government final consumption expenditure (% of GDP)
fdi	Foreign direct investment, net inflows (% of GDP)+ Foreign direct investment, net outflows (% of GDP)
pi	Portfolio Investment, net (BoP, current US$)
gdp	GDP (constant 2010 US$)
ca	Current account balance (% of GDP)
income	Adjusted net national income per capita (current US$)

Table 2. Countries

Albania	Chad	Haiti	Mexico	Singapore
Algeria	Chile	Honduras	Mongolia	Slovak Republic
Angola	China	Hungary	Montenegro	Slovenia
Argentina	Colombia	Iceland	Morocco	South Africa
Armenia	Comoros	India	Mozambique	Sri Lanka
Aruba	Costa Rica	Indonesia	Namibia	Suriname
Australia	Croatia	Ireland	Nepal	Sweden
Austria	Cyprus	Israel	Netherlands	Switzerland
Azerbaijan	Czech R.	Italy	New Zealand	Syrian Arab R.
Bahrain	Denmark	Jamaica	Nicaragua	Tajikistan
Bangladesh	Djibouti	Japan	Niger	Thailand
Barbados	Dominica	Jordan	Nigeria	Togo

Table 2. Countries (continued)

Belarus	Dominican R.	Kazakhstan	Norway	Tunisia
Belgium	Ecuador	Kenya	Oman	Turkey
Belize	El Salvador	Korea, Rep.	Pakistan	Turkmenistan
Benin	E.Guinea	Kuwait	Panama	Uganda
Bermuda	Estonia	Latvia	Paraguay	Ukraine
Bhutan	Ethiopia	Lebanon	Peru	U. Arab Emirates
Bosnia &H.	Fiji	Lesotho	Philippines	United Kingdom
Botswana	Finland	Liberia	Poland	United States
Brazil	France	Lithuania	Portugal	Uruguay
Brunei Darussalam	Gabon	Luxembourg	Qatar	Uzbekistan
Bulgaria	Georgia	Madagascar	Romania	Venezuela, RB
Burkina Faso	Germany	Malawi	Russia	Zambia
Burundi	Ghana	Malaysia	Rwanda	Zimbabwe
Cabo Verde	Greece	Maldives	Saudi Arabia	
Cambodia	Grenada	Mali	Senegal	
Cameroon	Guatemala	Malta	Serbia	
Canada	Guinea	Mauritania	Seychelles	
Central African R.	G.Bissau	Mauritius	Sierra Leone	

Table 3 presents the descriptive statistics for size and openness in terms of overall, within and between variations. Overall variation represents the change in years and countries. Between variation signifies the change across countries. Within variation indicates the change within countries (over years).

Table 3. Descriptive Statistics

Variable	**Variation**	**Mean**	**Std. Dev.**	**Min**	**Max**
size	overall	15.7370	6.6755	1.3752	88.9829
	between		4.9374	5.77882	31.5896
	within		4.6834	-3.30032	81.1979
openness	overall	75.2460	50.4966	4.9208	531.7374
	between		42.8617	19.1409	330.3475
	within		24.2606	-71.4833	415.4382

As can be seen Table 3, the size and openness mean values are 15.7370 and 75.2460, respectively. The minimum values are 1.3752 for size and 4.9208 for openness, while the maximum values are 88.9829 for size and 531.7374 for openness. For size, the standard deviation values of the overall, between and within variations are 6.6755, 4.9374, and 4.6834, respectively. This result suggests that there is more between variation from one country to the next than within variation. For openness, the standard deviation values of the overall, between and within

variations are 50.4966, 42.8617, and 24.2606, respectively. This result suggests that there is more between variation from one country to the next than within variation.

3.2. Model and Empirical Evidences

The paper employs a panel regression approach. Panel data includes both "time-series" and "cross-section" dimensions. Thus, the model is built upon inclusive observations provided by both "time-series" and "cross-section" data. As a result, degree of freedom is enhanced and a more robust model with fewer problems can be estimated (Baltagi, 1995).

The model estimated in this study is similar to the one used by Rodrik (1998) and is shown by:

$$\ln sizeit = \beta 0 + \beta 1 \ln opennessit-1 + \beta 2 \ln opennessit-1 * Dit + \Sigma_{j=1}^{m=4} \beta jXit + eit \quad (1)$$

Here, i (1,…N) shows the countries, t (1,…,T) indicates the time period and e_{it} is an iid error term. All variables are in natural logarithm terms (ln). Government final expenditure measures the dependent variable size as a percent of GDP. Open refers to trade openness lagged by one period to address the contemporaneous endogenity, and X represents the control variables: GDP (gdp); population (pop); rate of urbanization (urban); dependency ratio (dep).

Many studies throughout literature examine the relationship between government size and trade openness, which is hypothesized by Cameron (1978) and Rodrik (1998). The empirical findings are, however, controversial. Some studies suggest a positive relationship (Rodrik, 1998; Epifani and Gancia, 2009; Kimakova, 2009), while some other studies emphasize a negative relationship (Garrett and Mitchell, 2001; Benarroch and Pandey, 2008). On the other hand, this paper further extends the analysis to examine whether or not the relationship between government size and openness fluctuates in eight different classifications of countries: countries with low foreign direct investment versus countries with high foreign direct investment (D_fdi_{it}), low-current account versus high-current account countries (D_ca_{it}), countries with low portfolio investment versus countries with high portfolio investment (D_pi_{it}), and low-income versus high-income countries (D_income_{it}).

For this, we define eight different dummy variables (D_{it}) each of which represents a different classification. All the dummy variables based on any classification get a value of 0 for high-classification; get a value of 1 for low-classification. For example, for creating D_fdi_{it}, the sample is sorted from the bottom to the top according to foreign direct investment, and the sample is divided into two groups. The first group indicates countries with low foreign direct investment and coded as 1, while the second group represents the countries with high foreign direct investment and coded as 0. The same process is used to create other dummy variables, too.

Finally, to investigate whether or not there are any differences in the relationship between government size and openness based on different classifications, we introduce an interaction term ($lnopenness_{it-1} * D_{it}$) into the regression model and test whether the $\beta_1+\beta_2=0$ is significantly different from zero.

$$H_0 = \beta_1 + \beta_2 = 0 \quad (2)$$

B_2 is an interaction term that is estimated by multiplying the lagged value of openness with the dummy ($lnopenness_{it-1} * D_{it}$). B1 is a percentage change in government size associated with a

percentage change in openness for high-classification countries. This is because the interaction term becomes 0 if D_{it} is coded as 0 (for high classification countries), so the interaction term "disappears".

On the other hand, if D_{it} is coded as 1 (low-classification countries), the impact of openness on government size is now equal to $\beta_1 + \beta_2$. In practice, this means that for every one percent increase in openness, government size changes by the amount of $\beta_1 + \beta_2$ in low-classification countries (compared to just β_1 for high-classification countries).

Table 4. Openness and Size of Government

lngovernment size						
	no dummy	**dummy=fdi**	**dummy=ca**	**dummy=pi**	**dummy=income**	**dummy=gdp**
lnopen	0.0958*** (9.49)	0.0891*** (8.72)	0.0922*** (9.13)	0.103*** (10.15)	0.104*** (9.97)	0.0889*** (8.69)
$lnopen_{t-1}$*dummy	-	-0.0105*** (-4.05)	0.0148*** (5.57)	-0.0153*** (-6.53)	-0.0110** (-3.08)	0.0138*** (3.94)
lnpop	-0.0981*** (-9.32)	-0.0919*** (-8.65)	-0.0976*** (-9.29)	-0.0980*** (-9.35)	-0.0894*** (-8.20)	-0.0969*** (-9.21)
lngdp	0.111*** (19.46)	0.108*** (18.96)	0.123*** (20.21)	0.111*** (19.61)	0.0979*** (13.83)	0.122*** (19.25)
lnurban	-0.0427*** (-3.50)	-0.0444*** (-3.64)	-0.0484*** (-3.97)	-0.0379** (-3.11)	-0.0376** (-3.06)	-0.0454*** (-3.73)
lndepend	0.106*** (4.51)	0.102*** (4.36)	0.118*** (5.04)	0.106*** (4.51)	0.108*** (4.59)	0.102*** (4.35)
constant	1.359*** (7.59)	1.410*** (7.87)	1.075*** (5.79)	1.280*** (7.16)	1.439*** (7.96)	1.135*** (6.05)
Observations	6016	6016	6016	6016	6016	6016
Heteroskedasticity Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000
Autocorrelation Prob>F	0.000	0.000	0.000	0.000	0.000	0.000
H_0:laglnopen+lnopen*dummy=0						
p-Value	0.000	0.000	0.000	0.000	0.000	0.000

Modified Wald test and Wooldridge test are used for testing for testing heteroskedasticity and autocorrelation, respectively. Robust standard errors reported. t statistics in parentheses. The bottom row gives the test of significance for the estimated coefficient for openness for low-classification countries. * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Table 4 shows the estimation results. The estimated coefficient for population is negative and statistically significant for all the cases, which supports the previous findings that country size is a central factor in government size (Alesina and Wacziarg; 1998; Benarroch and Pandey, 2008; Benarroch and Pandey, 2012).

The sign of the relationship between government size and GDP is still controversial. Some researchers find a positive relationship, while some others emphasize a negative relationship. The results of our regression suggest a positive correlation between GDP and size of government like some others (Ram, 1986; Lin, 1994; Szarowská, 2011; Zakaria and Shakoor, 2011; Jiranyakul

and Brahmasrene, 2007).

In terms of the urbanization rate, the signs of the estimated coefficients are negative and statistically significant for most cases, which supports the findings of Rodrik (1998), Zakaria and Shakoor (2011) and Benarroch and Pandey (2012).

The estimated coefficient for dependency is positive and statistically significant for all cases as expectation (Alesina and Wacziarg; 1998; Benarroch and Pandey, 2008; Benarroch and Pandey, 2012).

The estimated coefficient for lagged openness is positively associated with government size, which is similar to the findings of Rodrik (1998) (Columns 1 of Table 4).

In order to investigate whether or not the relationship between openness and government size varies across some classifications, an interaction term between the dummy and the lagged value of openness is introduced into regression. We create 4 different dummies to represent four different classifications (i.e., D_fdi_{it} , D_ca_{it}, D_pi_{it}, and D_income_{it}).

Each column in Table 4 represents a different classification of dummy. For example, Column 2 in Table 4 represents the estimation results with the interaction term between the dummy for low foreign direct investment and the lagged value of openness ($lnopenness_{it-1}$ * D_fdi_{it}).

The results suggest a positive and significant correlation between size and openness for all the sub-classifications of the countries. However, H_0 is rejected at 1% level for all the cases, and one can conclude that there are significant differences between low- and high-classification countries. For example, the effect of openness on size is larger for countries with high foreign direct investment, portfolio investment and income than for countries with low foreign direct investment, portfolio investment and income, while the effect of openness on size is larger in low current account balance countries than in high current account balance countries.

4. Robustness Checks

To get more robust results, the present paper considers the full sample in two sub-samples based on population, trade openness, GDP, urban and age dependency ratio. This paper also considers whether or not the relationship between government size and openness fluctuates in six different classifications of countries: countries with low-gdp versus high-gdp countries, countries with low age dependency ratio versus countries with high age dependency ratio, countries with low government final expenditure versus countries with high government final expenditure, low-trade versus high- trade countries, low-urban population versus high-urban population countries, and low-population versus high- population countries.

Therefore, we first define six different dummy variables (D_{it}) each of which represents a different classification. All of the dummy variables based on any classification get a value of 0 for high-classification and a value of 1 for low-classification. For example, in order to create D_gdp_{it}, the sample is sorted from the bottom to the top based on GDP, and the sample is divided into two groups. The first group includes countries with low GDP and coded as 1, while the second group includes the countries with high GDP and coded as 0.

To get a more robust result, 6 different interaction terms between the dummy and the

lagged value of openness are introduced into the regression. We create six different dummies to represent six different classifications: D_gdp_{it}, D_depend_{it}, D_size_{it}, $D\_openness_{it}$, D_urban_{it}, and D_pop_{it}

Once the dummies are created, we first estimate the model from the full sample, and then reestimate the same model for the sub-sample periods. Table 5 supports the robust empirical evidence of the validity of the compensation hypothesis by indicating a positive and significant relationship between size and openness for all the sub-samples.

Table 5. Robustness Check

lngovernment size						
	no dummy	**dummy=dep**	**dummy=size**	**dummy=open**	**dummy=urban**	**dummy=pop**
lnopen	0.0958*** (9.49)	0.0964*** (9.55)	0.121*** (13.90)	0.0763*** (7.19)	0.0977*** (9.64)	0.0970*** (9.52)
$lnopen_{t-1}$*dummy	-	0.00698* (2.00)	-0.0973*** (-46.34)	-0.0182*** (-5.86)	-0.00661* (-1.99)	-0.00275 (-0.84)
lnpop	-0.0981*** (-9.32)	-0.0977*** (-9.28)	-0.0636*** (-7.01)	-0.0929*** (-8.81)	-0.0989*** (-9.39)	-0.101*** (-9.12)
lngdp	0.111*** (19.46)	0.107*** (17.81)	0.0496*** (9.80)	0.109*** (19.12)	0.108*** (18.15)	0.110*** (19.26)
lnurban	-0.0427*** (-3.50)	-0.0388** (-3.14)	-0.000939 (-0.09)	-0.0399** (-3.28)	-0.0446*** (-3.65)	-0.0419*** (-3.43)
lndepend	0.106*** (4.51)	0.134*** (4.90)	0.0771*** (3.82)	0.118*** (5.03)	0.0949*** (3.94)	0.103*** (4.34)
constant	1.359*** (7.59)	1.254*** (6.72)	1.881*** (12.21)	1.352*** (7.57)	1.531*** (7.71)	1.418*** (7.37)
Observations	6016	6016	6016	6016	6016	6016
Heteroskedasticity Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000
Autocorrelation Prob>F	0.000	0.000	0.000	0.000	0.000	0.000
H_0:laglnopen+lnopen*dummy=0						
p-Value	0.000	0.000	0.000	0.000	0.000	0.000

Modified Wald test and Wooldridge test are used for testing for testing heteroskedasticity and autocorrelation, respectively. Robust standard errors reported. t statistics in parentheses. The bottom row gives the test of significance for the estimated coefficient for openness low-classification countries. * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$

5. Conclusion

There are many studies throughout the literature that test the validity of the *compensation hypothesis*, but there is limited research testing whether the validity of this hypothesis varies in low- and high-classification countries. Thus, the present paper extends the analysis to investigate whether or not the relationship between government size and openness fluctuates in low- versus high-classification countries. In parallel with the current literature, the classifications are constructed based on foreign direct investment, current account, portfolio investment, and income. The results show a positive and significant relationship between size and openness

for all the sub-classifications of countries. However, it is concluded that there are statistically significant differences between low- and high-classification countries. For example, the effect of openness on size is larger for countries with high foreign direct investment, portfolio investment and income than for countries with low foreign direct investment, portfolio investment and income, while the effect of openness on size is larger in low current account balance countries than high current account balance countries. In conclusion, by using a panel of 145 countries over the period 1970-2017, this paper presents robust empirical evidence of the validity of *the compensation hypothesis* proposed by Rodrik (1998).

Ethics Statement

No human studies are presented in this manuscript.

Author Contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of Interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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